F. E. Munch.
2450 Indiana Ave
Chicago Ill
Flat 4.

Anatomy of the Menstruating Uterus

FRED E. MUNCH.

BY

PALMER FINDLEY, M.D.
Associate in Gynecology and Obstetrics, Rush Medical College, Chicago

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FRED E. MUNCH.

ANATOMY OF THE MENSTRUATING UTERUS.[1]

KUNDRAT and Engelmann were the first to record anatomical observations on the menstruating uterus. These observations were made on cadavers in which the endometrium of the uterine body had undergone fatty degeneration and the surface epithelium was exfoliated.

Later Williams made postmortem examinations of twelve menstruating uteri. Nine of the twelve cases died of acute infectious diseases. He found fatty degeneration of the mucosa of the uterine body, as did Kundrat and Engelmann, and stated that the entire mucosa down to the musculature was exfoliated, that following menstruation the mucosa was regenerated from the musculature.

Leopold recognized the observations of Kundrat, Engelmann, and Williams as faulty, in that the changes in the endometrium as described by them might result from the acute infectious and chronic wasting diseases which were the causes of death. He carefully excluded all such, selecting those of normal menstrual type. He failed to observe fatty degeneration of the mucosa, but agreed that the surface epithelium was shed in the menstrual process. He does not state how long after death the sections were made, or the method of preparing the specimens. Within a few hours, certainly within twenty-four hours, after death or hysterectomy the surface epithelium undergoes degenerative changes and may be wholly lacking in microscopic sections.

It was Möricke who first excluded the possibility of postmortem and postoperative changes in the uterus by examining scrapings from the normal menstruating uterus. He curetted and made microscopic examinations of forty-five menstruating uteri in all stages of menstruation. In every instance the surface epithelium was found intact. In two additional cases Löhlein reported similar findings.

[1] Read before the Chicago Gynecological Society, January 17, 1902.

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Westphalen also made a series of examinations of scrapings of the mucosa during the various stages of menstruation. In every case where the mucosa was normal the entire mucosa was well preserved; in morbid conditions of the mucosa part or all of the surface epithelium was shed. Mandle confirmed these findings.

The most elaborate observations were carried out by Gebhard in Berlin. He not only examined scrapings, but also sections of uteri removed during the menstrual period for lesions not involving the endometrium. He classifies the anatomical changes into three stages:

1. *The stage of premenstrual congestion,* in which the capillaries of the mucosa are congested; a serous or sero-sanguineous exudate infiltrates the stroma of the mucosa, widening the intercellular spaces; later the blood leaves the capillaries and infiltrates the stroma, gravitating in the direction of least resistance, *i.e.,* toward the uterine cavity, and forming a collection of blood beneath the surface epithelium.

2. *The stage of active hemorrhage,* in which the blood is forced between the epithelial cells into the uterine cavity; here and there the epithelium is lifted from its bed, the continuity of the surface is broken, and bits of epithelium are accidentally broken off and are carried with the menstrual flow. Blood may also find its way into the gland lumina.

3. *The stage of postmenstrual involution,* in which the blood vessels become less engorged; blood is no longer extravasated into the connective-tissue spaces; the blood left in the stroma is slowly absorbed; the surface epithelium lifted from its bed resumes its former place, and lost epithelium is rapidly regenerated from adjacent epithelial surfaces.

These three stages are represented in the accompanying plate. The sections here illustrated were taken from specimens removed by Dr. J. Clarence Webster in the Presbyterian Hospital. Five hysterectomies were performed by Dr. Webster during the various stages of menstruation. In the three cases from which these specimens were taken the menstrual type was normal; in the other two there was an excessive menstrual flow resulting from endometritis associated with fibroids. Sections from the last two are not presented because of the morbid state of the endometrium; in them the surface epithelium was not seen.

Immediately upon removal the uterus was placed in salt solu-

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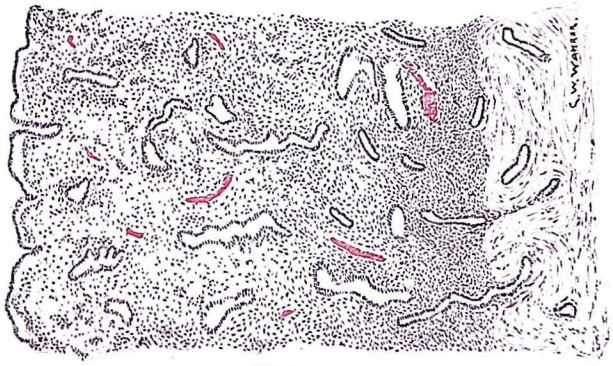

FIG. 1

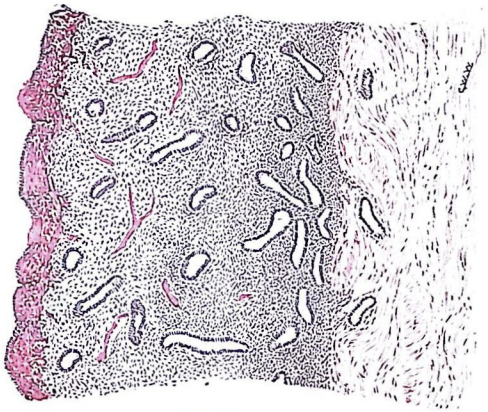

FIG. 2

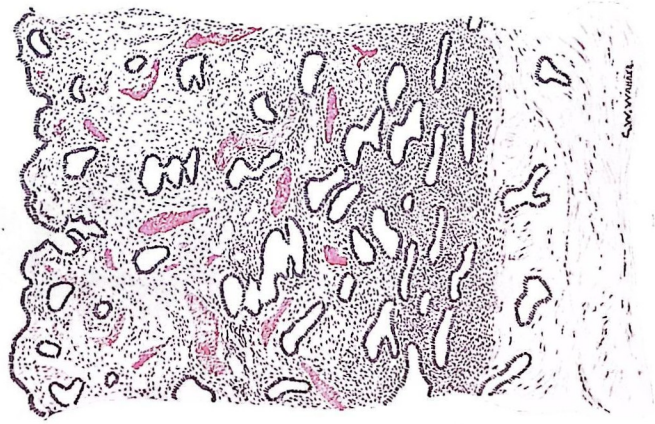

FIG. 3

ANATOMY OF THE MENSTRUATING UTERUS.

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tion, taken to the laboratory, and placed in Zenker's solution for twenty-four hours. Sections were then made from various parts of the endometrium, from the tube and cervix; they were then carried through the usual technique in preparing celloidin sections.

Figure 1 represents a specimen removed twenty-six hours after the onset of the menstrual flow. It corresponds to the first stage of Gebhard. The capillaries, which are rarely visible in the intermenstrual period of the normal uterus, are here shown to be widely dilated; a sero-sanguineous exudate permeates the stroma, widening the intercellular spaces; these changes are more marked near the surface. The glands are not affected, and the surface epithelium is intact and apparently normal.

Figure 2 represents a specimen removed on the third day of menstruation, and corresponds to the second stage of Gebhard. The "subepithelial hematoma" is well marked; the surface epithelium is lifted from its bed by the blood beneath; here and there the blood has burst through the epithelial covering and has carried away with it small bits of epithelium. Fatty degeneration of the mucosa is not in evidence.

Figure 3 represents a specimen removed the day following the cessation of the menstrual flow; it corresponds to the third stage of Gebhard. The blood vessels are less engorged than in the preceding specimen; the blood extravasated into the stroma is less in amount and does not give the appearance of fresh blood. The surface epithelium is intact and closely adherent to the stroma.

In all five cases the tubes show no changes and the cervix is somewhat congested. The anatomical changes characterizing menstruation are confined to the mucosa of the uterine body.

While our knowledge of the physiology of menstruation is far from exact, we are in possession of well-established facts relating to the anatomy of the menstruating uterus. Möricke, Mandle, Gebhard, Herzog, and others have demonstrated beyond dispute, as do these specimens here presented, that menstruation is not a shedding process, that the loss of epithelium is purely accidental and limited. Previous observations were at fault in the technique of preparing the sections, and in the selection of material which had undergone cadaveric changes, and degenerative changes common to infectious and chronic wasting diseases.

100 STATE STREET.

FRED C. MUNCH.